

### **REMARKS**

Claims 1-22 are pending in the Office Action. Applicant has cancelled claims 5, 7, 9, 14, 16 and 18, and amended claims 1 – 4, 6, 8, 10-13, 15, 17 and 19-21. Applicant respectfully submits that the amendments are based in the specification as filed and requests that the amendments be entered. Reconsideration and allowance for claims 1-4, 6, 8, 10-13, 15, 17 and 19-22 is now respectfully requested.

Because of the numerous objection and rejections, the Applicant will address the objects/rejections in the order presented.

#### **A. Inventorship**

Applicant appreciates the reminder provided in paragraph 1, page 2 of the Office Action to point out claims that were not commonly owned at the time the invention was made. All the subject-matter of the present invention as claimed is commonly-owned by the University of Nottingham.

Applicant also appreciates the advice in paragraph 2, page 2 of the Office Action to obtain representation by a registered patent attorney to prosecute this application before the United States Patent and Trademark Office.

#### **B. Objections to the Drawings**

In paragraph 3, page 3 of the Office Action, the drawings were objected to under 37 C.F.R. 1.83(a) as not showing the communication interval which is negative up to the total turn off delays of claim 7 and the timers of claim 17. In order to advance prosecution of the pending claims, Applicant has canceled claim 7 and deleted the limitation of "the timers" in claim 17 to exclude subject-matter not illustrated. As such, Applicant respectfully submits that amendment to the drawing is not required and requests that the objection to the drawings be withdrawn.

**C. Objections to the Specification**

The Office Action, on paragraph 4, page 4, objected to the title of the invention as not being descriptive. By this amendment, the Applicant has amended the title to now read: "A Matrix Converter Having A Plurality Of Bi-directional Switches". As such, Applicant respectfully requests that the objection to the title be withdrawn.

Paragraph 5, page 4 of the Office Action, requested the Applicant's assistance in correcting any errors in the specification of which the applicant is aware. Except for the amendments to the specification made herein, the Applicant believes that no other amendments to the specification are required.

Paragraph 6, page 4 of the Office Action, objected to the disclosure of the specification as lacking in the explanation of the claims and the claim limitations. The Office Action asserted that only general descriptions of the actual claimed invention were provided in the invention summary. The Office Action asserted that especially the detailed description failed to distinctly describe and particularly illustrate the claimed invention. The specification is generally narrative concerning information not claimed and barely supports what is claimed. The Office Action requested appropriate correction.

Applicant respectfully traverses this objection to the specification. The original claims as filed form part of the original specification. As such, even if, as the Office Action avers, the detailed description is lacking in support of the claims, the original claims provide sufficient support. Furthermore, the Applicant asserts that the claims as amended receive ample support from the specification. If the Examiner has concerns about certain claims not being adequately describe in the detailed description, the Applicant invites the Examiner to particularly point out these claims.

However, Applicant thanks the Examiner for providing guidance as to the preferred layout of the specification and the Applicant has made amendments to the specification to better clarify the arrangement of the specification.

**D. Objections to the Claims**

Paragraph 7, page 5 of the Office Action objected to claims 4-6, 8, 13-16 and 19-22 under 37 C.F.R. 1.75(c) as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claims. By this Amendment, applicant has amended the claims to remove any multiple dependencies. As such, Applicant respectfully requests that this objection be withdrawn.

The Office Action in paragraph 8, page 6, objected to claims 3, 7 and 12 because of spelling informalities. By this response, Applicant has amended claim 3 and 12 to correct the spelling therein and cancelled claim 7. As such, Applicant respectfully requests that this objection to claims 3, 7 and 12 be withdrawn.

**E. Rejection under 35 U.S.C. 112, second paragraph**

Paragraphs 9 through 11, page 6 and 7 of the Office Action rejected various claims based on 35 U.S.C. 112, second paragraph.

Specifically, paragraph 10 of the Office Action rejected claims 1-3, 7, 10-12 and 17 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Office Action asserted that in claim 1, there was insufficient antecedent basis for "the switch means" in line 3 of original claim 1. By this amendment, the Applicant has replaced the term "the switch means" with "the plurality of bi-directional switches" which receives antecedent basis from "a plurality of bi-directional switches" located on line 3 of the newly-amended claim 1.

The Office Action asserted that in claim 3, there was insufficient antecedent basis for "the commutation interval" in line 2 of original claim 3. Applicant asserts that claim 1 has been amended to add the limitation of "a commutation interval," thus providing the term "the commutation interval" in claim 3 with proper antecedent basis.

Finally, the Office Action identified various limitations in claim 7, which did not appear to have proper antecedent basis. Claim 7 has been cancelled and, as such, the antecedent basis rejections with respect to claim 7 are rendered moot.

Applicant has also reviewed the claims and attempted to ensure that all of the claim limitations have proper antecedent basis.

Paragraph 11 of the Office Action rejected claims 9, 17 and 18 under 35 U.S.C. 112, second paragraph as being indefinite in that these claims fail to point out what is included or excluded by the claim language and that these claims were omnibus type claims. By this amendment, claims 9 and 18 have been cancelled and, as such, the indefiniteness rejection with respect to these claims is rendered moot. Claim 17 has been amended to depend from independent claim 10, and thus incorporates the limitations of claim 10. Since claim 10 was not rejected as an omnibus type claim, Applicant respectfully requests that the indefiniteness rejection with respect to claim 17 be withdrawn.

**F. Rejections under 35 U.S.C. 102**

Paragraphs 12 and 13, page 7 of the Office Action rejected claims 1-22 under 35 U.S.C. 102(b) as anticipated by U.S. Patent No. 5,949,672 to Bernet. Claims 5, 7, 9, 14, 16 and 18 have been cancelled and, thus, the anticipation rejection with respect to these claims is rendered moot. With regard with the anticipation rejection with respect to claims 1 – 4, 6, 8, 10-13, 15, 17 and 19-22, Bernet discloses the use of additional passive components (capacitors and inductors) to

provide a resonant circuit to allow current commutation between the bi-directional switches, the resonant circuit inevitably resulting in a substantial inherent time delay for the commutation operation to be achieved.

In Bernet, a resonance capacitance is connected in parallel with each main switch, or an output capacitance of power semiconductors of the main switches acts as a resonance capacitance. An auxiliary commutation device is provided between three-phase output connections of each switch group with an auxiliary switch constructed as a four-segment switch and a resonance inductance connected in series to effect soft switching operation.

The present invention relates to a wholly different type of matrix converter which operates in a different manner, incorporating hard switching of the devices without the use of additional passive components. Moreover, the present invention is directed to a bi-directional switch arrangement with a commutation interval approaching or equaling zero. Thus the present invention is not anticipated by Bernet.

Furthermore, there is no teaching in Bernet which teaches or suggests a bi-directional switch arrangement with a zero or near-zero commutation interval. Rather, Bernet discloses only auxiliary device resonant circuits which incorporate inherent substantial delays, such that Bernet teaches away from the present invention.

As such, the Applicant respectfully requests that the anticipation rejection with respect to claims 1-4, 6, 8, 10-13, 15, 17 and 19-22 be withdrawn.

**G. Conclusion**

In view of the foregoing, applicant respectfully requests the Examiner's consideration and allowance of claims 1-4, 6, 8, 10-13, 15, 17 and 19-22 as presented herein.

Applicant notes that this response does not discuss every reason why the presented claims are distinguished over the cited prior art. Most notably, applicant submits that many if not all of the dependent claims are independently distinguishable over the cited prior art. Applicant has merely submitted those arguments which it considers sufficient to clearly distinguish the claims over the cited prior art.

In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, the Examiner is requested to contact the undersigned attorney.

Dated this 22nd day of November, 2006.

Respectfully submitted,

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